BRITISH COLUMBIA PROVINCIAL MUSEUM

HANDBOOK No. 3

THE REPTILES
OF BRITISH COLUMBIA

By G. CLIFFORD CARL

VICTORIA, B.C. • • APRIL, 1944

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By G. CLIFFORD CARL

VICTORIA, B.C.
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The Reptiles of British Columbia.

INTRODUCTION.

THE animals forming the group known to biologists as the class *Reptilia* include the lizards, snakes, turtles, alligators, and crocodiles. Altogether there are over four thousand species of living reptiles and they are found in all temperate and tropical regions throughout the world. In British Columbia the group is represented by at least twelve species, of which three are lizards, six are snakes, and three are turtles.

To most persons the chief distinguishing feature of reptiles is that they are cold-blooded and clammy to the touch. Actually, reptiles share this character with all animals below them in the scale of life, and so we must find some other features to distinguish them from apparently similar forms. Reptiles can be better defined by saying they are cold-blooded vertebrates (animals with a backbone), breathing by means of lungs during all stages of life, and possessing a scaly, horny, or leathery covering over the body. They thus differ from amphibians in several respects. First, reptiles have no larval life in which breathing is carried on by means of gills, as in frogs and salamanders. Second, they have a dry skin reinforced with scales or with bony or leathery plates, instead of an unprotected and usually moist skin as in amphibians.

On the other hand, some reptiles resemble certain amphibians in a number of features, such as general body plan and the aquatic habits of some members. Birds, too, have certain reptilian characters, such as scales on the legs, scale-like arrangement of feathers, and a shelly covering to the egg. Reptiles, therefore, form a connecting link between amphibians and birds and thus are of considerable biological interest.

STRUCTURE.

Reptiles as a group live in a great variety of habitats and, as a result, they show a corresponding number of adaptations in structure and habits.

This specialization has given rise to three distinct types of body form which are represented in British Columbia by the lizards, snakes, and turtles.

LIZARDS.—The lizards show the least specialization in the form of the body. In general a lizard consists of a head, a trunk with four legs, and a tail; the head is usually separated from the trunk by a distinct neck. The mouth is large and is provided with teeth on the upper and lower jaws. The tongue of many lizards is protrusible, long and forked at the tip. The eyes are usually of medium or small size and have vertical or round pupils and well-developed lids. The ear is visible as a membrane (tympanum) or as a distinct opening. The legs are well developed and are provided with claws. In certain subterranean species, not found in British Columbia, the legs are absent.

A conspicuous feature of lizards is the covering of scales arranged in definite patterns. Those on the head are usually in the form of plates and the arrangement is so characteristic that their form and position is used in determining the species.

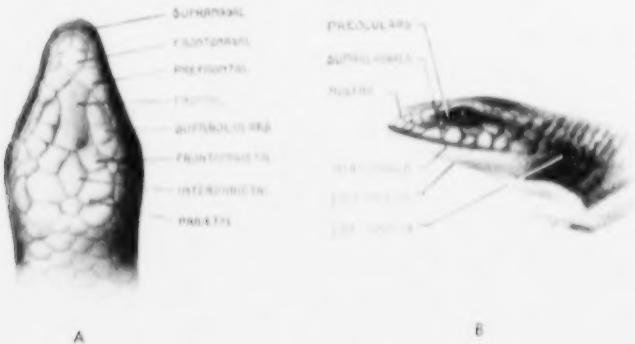


Figure 1. Head of Alligator lizard to show structure.
(A) Top view. (B) Side view.

Figure 1 shows the scale and plate patterns on the head of the Alligator lizard. Some of the more important plates often used in identification of species are the "preoculars" in front of the eyes, the

"supralabials" along the upper jaw, the "infralabials" along the lower jaw, and the "chin-shields" on the throat.

Some of the scales on the upper part of the body of the Alligator lizard bear a prominent keel or ridge along the mid-line of each scale. In other lizards—for example, the horned "toads"—the plates of the back of the head and some of the scales of the body and tail are modified to form spines.

From time to time the horny outer layer of skin is shed in patches, revealing a shiny new coat underneath.

SNAKES.—Snakes appear to have a simpler body form than lizards but in reality they are much more highly specialized. In this group the specialization involves structural changes such as the elongation of the body and the loss of the limbs, changes which have enabled snakes to adopt special ways of life. With regard to these modifications Logier (1939, p. 7) says:—

> Locomotion is effected by lateral undulations of the body and by the backward and forward movement of the enlarged transverse ventral scales. Each of these "ventrals" is connected with the distal end of a pair of ribs which in turn are movably articulated with the spine. The most outstanding modification of snakes is concerned with the swallowing apparatus. The lower jawbones of each side are loosely united in front by an elastic ligament, the suspending bones (quadrates) to which they are hinged behind are loosely connected by another pair of movable bones (squamosals) with the skull, so that they have great freedom of movement. The ribs, as mentioned above, are movably articulated with the vertebral column and the skin is very stretchable. This elastic arrangement of jaws, ribs and skin makes possible the swallowing of whole animals which are of much greater diameter than the snake's head or neck. The tooth-bearing bones of the upper jaw (maxillaries, pterygoids and palatines) are movably articulated with the skull, and, like the bones of the lower jaw, those of either side can be moved independently of the other. Swallowing is accomplished by a "walking" movement of the jaws, those of one side being first pushed forward over the prey and then drawn backward while those of the other side are pushed forward. The needle-shaped, backward projecting teeth of each side naturally release their hold and slide over the prey during the forward movement and grip during the backward pull. In this manner the snake literally pulls itself outside of its victim which is forced down the gullet to the stomach by muscular contractions and slight sidewise bendings of the body.

In addition to these differences between snakes and lizards, snakes have no eyelids and no external openings of the ears.

As in lizards, snakes have a body-covering of overlapping scales arranged in characteristic patterns. The arrangement of the scales and plates of the head region is similar to that in lizards and is shown in Figure 2, which also gives the names of some of the scales commonly used in the identification of species. The scales of the back and sides of the main portion of the body are arranged in longitudinal rows and the number of rows of scales is used in distinguishing species. These scales may be smooth, keeled, or pitted.

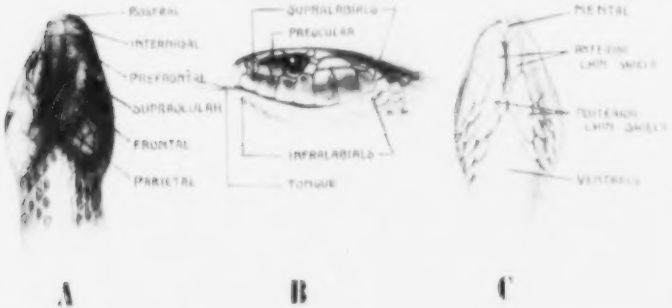


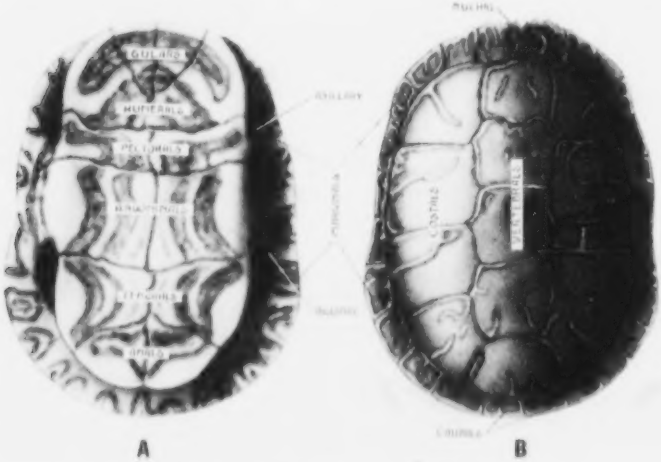
Figure 2. Head of Garter snake to show structure.
(A) Top view. (B) Side view. (C) Under-surface.

The ventral surface is covered with two series of large plates. Extending from the throat to the anal opening these plates are single and are known as "ventrals." Extending from the anal opening to the end of the tail is a series of plates which may be single or divided; these are known as "caudals." The scale immediately in front of the anal opening is called the "anal plate" and may be single or divided, according to the species.

Snakes shed their skin periodically, but unlike lizards they remove it usually in one piece and inside out. As the time of moulting approaches, the snake probably becomes partially blind as the skin over the eyes commences to loosen. Shedding starts at the head, the skin being loosened from the jaws by rubbing the snout along the ground.

The skin is then peeled back and removed inside out as the snake crawls forward, rubbing itself through the grass. In the case of rattlesnakes, a new segment is added to the rattle at each shedding of the skin.

TURTLES.—Turtles and tortoises have such a characteristic body form that they are easily distinguished from all other animals. The outstanding feature in the structure of the members of this group is



A B

Figure 3. Shell of Western Painted turtle.
(A) Under-surface (plastron). (B) Upper surface (carapace).

the bony or leathery shell, which is composed of an upper portion called the "carapace" and a lower portion called the "plastron." These shields are usually covered with horny plates called "scutes," but in some species, such as the marine turtle *Dermochelys*, they are covered with a leathery skin. When scutes or plates are present they are usually in a definite pattern and are named according to their position, as shown in Figure 3.

The turtle's head is somewhat snake-like in appearance, but differs in several respects. The jaws lack teeth but are provided with sharp,

horny cutting-edges. The tongue is thick and is not protrusible. The eyes are of medium or small size, usually with round pupils and well-developed eyelids. Ears are present but are visible only as a skin-like tympanic membrane situated on the side of the head. The legs are strongly developed and are provided with claws. In terrestrial species such as most tortoises the limbs and toes are thick and stubby. In marine species they are paddle-like and webbed to form "flippers." However, in most fresh-water turtles which occasionally crawl out on land the legs are only slightly flattened while the toes are long, fully webbed, and provided with long sharp claws. In many species the head, legs, and tail can be withdrawn into the shell for protection.

As in other reptiles, the horny outer covering of turtles is shed at intervals; with this difference, that the covering of each scute peels off separately. The skin of the rest of the body is shed in fragments.

MEANS OF DEFENCE.

For protection from enemies, reptiles rely to a large extent upon their scaly or bony skin-covering, their concealing colour patterns, and their fleetness of movement. When cornered, however, some reptiles resort to a more active means of defence. Some examples are given here.

LIZARDS.—The most common reaction in lizards is to open the mouth to its fullest extent and to make a hissing sound by expelling air from the lungs. Some species have collars of spines which can be erected in a menacing manner. Others inflate the body with air, rendering it difficult if not impossible for them to be swallowed by animals such as snakes. All of them may attempt to bite but, except for the venomous Gila monster of the desert regions of the southern States and the Beaded lizard of Mexico, no species of lizard on this continent can inflict a serious wound to man.

The Alligator lizard of British Columbia has a specialized means of self-preservation which deserves special notice. When danger threatens this species in the form of a pursuing animal or man it is capable of casting off a portion of its tail, which writhes and twists on the ground for a period of several minutes. While the pursuer stops to investigate this activity the lizard may make good its escape. If one examines a lizard that has just lost its tail it will be noted that

there is very little loss of blood. It has been found by observation that a scab quickly forms over the stump and that a new tail soon begins to grow. The regenerated part never attains the length of the original tail and is usually of a slightly different colour. The Western skink also has the ability of casting off its tail in a similar manner.

An even more remarkable means of defence is found in some species of horned toads. When these lizards are teased or attacked they are able to "squirt blood from the eyes," an unexpected action which no doubt serves to frighten off some attackers. As a result of careful observation it has been found that the first indication of this phenomenon is the swelling of the eyelids to two or three times their normal size so that they bulge from the head. During this procedure

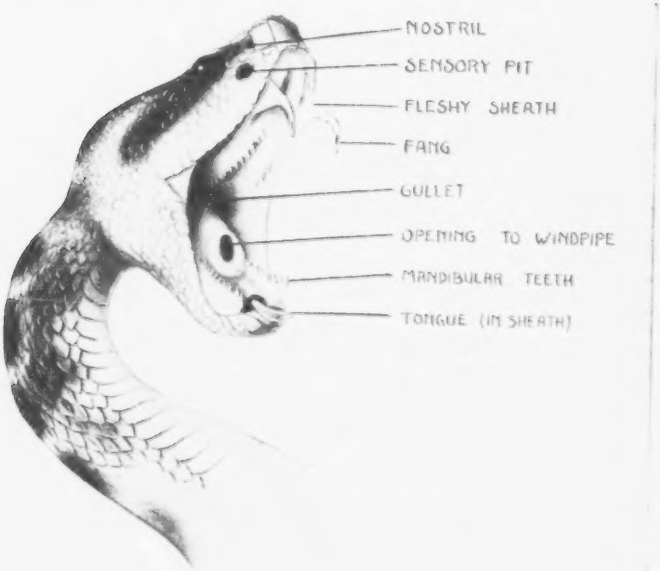


Figure 4. Head of Pacific rattlesnake to show structure.

the eyes are tightly closed and the animal remains quiet. Suddenly a fine stream of blood shoots up from beneath the upper eyelid, usually with force enough to send it 6 or 8 inches before dividing into fine drops. There seems to be no record of the Pygmy Horned toad in British Columbia squirting blood in this manner, but it is possible that it has this ability.

SNAKES.—When cornered, the most common means of defence among snakes is an attempt to bite, sometimes accompanied by a hissing noise produced by expelling air from the lung. In most cases, as far as humans are concerned, the bites are quite harmless, only the worst ones breaking the skin and drawing blood. However, in the case of the Pacific rattlesnake, which is venomous, the bite is harmful and may even be fatal. In this species certain teeth of the upper jaw are elongated and hollowed to form fangs which inject venom into the wound. These specialized teeth are located near the front of the jaw and are so arranged that they may be erected when the mouth is opened (Figure 4). When the mouth is closed and when the prey is being swallowed the fangs rest against the roof of the mouth. Occasionally they may be used to aid in working the jaws over large prey. The fangs are replaced at intervals by new ones which are kept in reserve imbedded in capsules behind those in use; this takes care of accidental loss or damage and allows for growth. It may be noted that the removal of fangs as a safety precaution in the case of captive rattlesnakes is only effective until the new fangs move into place.

The rattle may also be classified as a means of defence, since its main purpose appears to be to give warning to would-be enemies. It is made up of a series of loosely interlocking rings of horny material so arranged that a characteristic dry, rattling sound is produced when vibrated by the tail muscles (Figure 5).

Figure 5. (A) Rattle of Pacific rattlesnake. (B) Diagram in cross-section to show interlocking mechanism.

Garter snakes have still another means of defending themselves in the form of scent glands located at the base of the tail. When molested, the snake pours out from these glands a secretion which has a powerful, evil-smelling odour which probably discourages most animals from attacking the snake further.

The harmless Rubber boa, when disturbed, sometimes coils itself into a ball with its head underneath and with its tail elevated as if it were the head.

TURTLES.—As a result of their size and protective shell, turtles are relatively immune from attack by enemies. When cornered, however, most make attempts to bite and may also produce a hissing sound similar to that of snakes and lizards. The two fresh-water turtles of this Province, being of comparatively small size, can inflict little damage to man by biting but the much larger sea-turtle can be quite formidable at close quarters, an individual being known to bite through the oar of a boat with one snap of its jaws.

MYTHS AND POPULAR BELIEFS.

Reptiles, particularly snakes, have always been of fascinating interest to man and many beliefs, true or otherwise, have arisen concerning them. Apparently from the beginning of time man's attitude has been one of fear and distrust and, possibly as a result of this, many of the beliefs connected with snakes are based on inaccurate observation or on faulty logic. In spite of modern knowledge many incorrect impressions still persist and, therefore, it might be well to mention a few here.

The most persistent and most widespread belief appears to be the one concerning snakes swallowing their young in times of danger. Although there are many eye-witness accounts there are many reasons why scientists do not accept this story as being true. One of the most obvious reasons is that the observations have always been made by an untrained person and apparently never by a serious student of reptiles. A possible explanation of the origin of this story may be found in the fact that some snakes, such as garter snakes, give birth to living young. It is not unreasonable to suppose that if a female snake heavy with young was killed and mangled in such a way that the young snakes were allowed to escape a person might make the mistake of assuming that the young had been "swallowed."

Another current belief is that snakes "hypnotize" their prey or that the unhappy victim is so transfixed by fear that it is easily taken by the reptile. The basis of this myth probably is found in the fact that snakes' eyes, being without lids, have a fixed look resembling that which a hypnotist is supposed to have. As a matter of fact, in most cases the small bird, mammal, or other animal which falls prey to a snake probably does not sense danger until it is actually seized.

In connection with rattlesnakes, it is believed by some that these reptiles can leap a considerable distance to strike their prey. Experiments show, however, that a snake can not strike beyond its own length; in fact, the distance is usually much less, since as a rule the animal strikes from a coiled position.

Many persons also believe that a rattlesnake's age can be determined by counting the number of segments to the rattle. As already stated, a new section is added to the rattle each time the snake sheds its skin and, since this may occur several times a season and not just once a year, the number of segments indicates the number of moults and not the age of the reptile. Moreover, segments of the rattle are continually being lost by breakage or wear so that it is very unusual to find an adult snake with a complete set of rattles. It is impossible to tell a snake's age by counting the number of "rings" in the rattle.

Myths about snakes are almost beyond number; we can mention here only one other, which is to the effect that when mortally wounded snakes do not die until sunset; a belief probably originating from the fact that the muscles of a dead reptile continue to twitch long after the animal has expired.

REPTILES IN INDIAN FOLK-LORE AND BELIEFS.

References to reptiles are found in the folk-lore, legends, and beliefs of several British Columbia Indian tribes, but in general this group plays a less prominent part than the more conspicuous animals. Among the Kootenay Indians there is a story concerning the "mud-turtle" (Chamberlain, 1892) which, without doubt, refers to the Western Painted turtle since this is the only species known in the area occupied by this tribe of Indians. Among the Shuswap people of the South Thompson river there is a tale about a rattlesnake with a head

at each end. These Indians believe that to see such a creature is very unlucky and portends of death of some near friend (Dawson, 1891).

It is interesting to compare this belief with the one concerning "Sisiutl," the double-headed snake of the Kwakiutl Indians. To see or touch this mythical monster meant certain death, but to those who enjoyed supernatural strength it imparted more power; its blood when applied to the skin made it as hard as stone and the eyes, used as stones, could kill whales.

As a matter of fact two-headed snakes are sometimes found in nature; three have been found in the vicinity of Vancouver in recent years. In these freaks, of course, both heads are on one end of the body, but the finding of such a specimen may have given rise to these ancient beliefs.

Still another supernatural snake is "Haietlik," the lightning snake of the Nootkan Indians of the west coast of Vancouver island. This creature is often shown in illustrations as snake-like in general form, with a sharp head, large mouth, and protruding tongue. It was supposed to be used as a harpoon by the Thunderbird when hunting whales.

Various portions of reptiles were sometimes used in making charms and philters. As example, the Kwakiutls of British Columbia believed that wearing a snake's skin or a snake's tongue caused the wearer to become irresistible to everybody. They also believed that a person could be bewitched by placing a portion of the victim's clothing in the mouth of a lizard of which the head has been cut off, placing this in a snake's head and putting the whole inside the mouth of a frog (Boaz, 1896). Some members of the Salish tribe believe that the tail which has been dropped by a pursued lizard can be used to make a powerful love potion; "medicine" containing dried lizard tails obtained in this way commands a high price among these people.

DISTRIBUTION.

Most of the reptilian species of British Columbia are found in that portion of the Province south of the 51st parallel of latitude. Garter snakes appear to be the only reptiles that are found north of this area. In attempting to explain this distribution two reasons may be given: In the first place, reptiles are "cold-blooded" and therefore the amount of their activity is dependent upon temperature which

in turn is influenced by climate. As a result, reptiles are able to live and breed only in areas which have a sufficiently long summer period. In this Province such areas are found in the southern portion. Garter snakes are able to exist farther north, possibly as a result of special adaptations in connection with breeding habits.

In the second place, since all living things in British Columbia were supposedly forced southward or were exterminated by the latest ice-sheet, the reptiles, along with certain other animals and plants, must have re-entered the Province from the south following the retreat of the ice. That this is true in the case of reptiles is supported by the fact that, except the Leather-back turtle, which is marine, all species found in this Province appear to have their centres of abundance south of British Columbia with the northernmost limits of their range within this Province.

Our knowledge of the distribution of reptiles in British Columbia is by no means complete. It is true that the general range of each species is fairly well known, but the exact extent and particularly the northern limits of many species have yet to be determined.

ECONOMICS.

The reptiles of British Columbia are of importance to man in several ways. As a natural control of certain pests, snakes are of considerable value. The larger species, such as the Gopher snake and the Pacific rattlesnake, destroy large numbers of mice, ground-squirrels, and other destructive rodents each year. The smaller forms, such as garter snakes, prey upon slugs, insects, and similar garden pests.

Apart from its usefulness as a rodent destroyer, the rattlesnake may be considered to have a minor economic value as a source of venom which is used in medicine in immunization laboratories or as an anti-coagulating agent in certain blood experiments.

Lizards also consume insects, grubs, and other small forms of life, but since they are much less numerous and much less widely spread than snakes they probably are of little importance in controlling the numbers of destructive forms of life. The Alligator lizard of the coast, however, is now recognized to be of considerable importance as a carrier of the Coast tick, which has recently attained prominence as a pest of man, pets, and live stock. For this reason the abundance,

distribution, and life-history of this reptile is of some interest to scientists who are studying tick parasites in this Province (*see* Gregson, 1942).

The turtles of British Columbia are of no great economic importance. None of the three species occurring in the Province is numerous enough to be of importance as food, although they are all edible and the Western Painted turtle has at times been eaten by Indians and others. The Painted turtle may be regarded by fishermen as a pest when it invades fishing waters but in general it is not harmful. On the contrary, the presence of this brightly coloured reptile should be considered an asset, particularly to those who enjoy studying the wild-life of our Province.

IDENTIFICATION OF SPECIMENS.

In most cases the illustrations accompanying the following notes will serve to identify reptiles found in this Province. In doubtful cases the use of the "key" will aid in the identification. In making use of a key start with the first line, numbered 1, checking the features listed with those of the specimen to be identified. If the description fits pass on to the statement following, but if the characters do not apply pass on to the alternative statement the number of which is given in parentheses. Proceed in this way until the name of the animal is reached, and check the identification by means of the more detailed information given in the notes under the species account.

If there is still doubt as to the identity of the reptile it is recommended that the specimen be sent to the Provincial Museum, Victoria, B.C., for examination. Living reptiles may be easily sent through the mail by placing them in a cloth bag securely tied and enclosed in a wooden or strong cardboard box. Dead reptiles should first be well soaked in 70-per-cent. alcohol or 10-per-cent. formalin, allowing the solution to enter the body-cavity through a slit, after which they may be mailed in the moist condition in a water-tight container such as a jam tin. If these preservatives are not easily obtained decomposition of dead specimens may be checked during shipment through the mail by packing in common salt. In this case, also, the body should be opened by a slit and some of the salt should be placed within the body-cavity. A tight container, such as a jam tin, should also be used for mailing since a certain amount of moisture may be present.

KEY TO THE LIZARDS OF BRITISH COLUMBIA.

1 (2) Body short and squat; skin spiny
Pygmy Horned Toad (*Phrynosoma orbiculare douglassii*).

2 (1) Body long and slender; no spines

3 (4) Four longitudinal stripes on body; no skin fold on side
Western Skink (*Eumeces skiltonianus skiltonianus*).

4 (3) No stripes on body; skin fold present on side
Northern Alligator Lizard (*Gerrhonotus cæruleus principis*).

PYGMY HORNED TOAD. *Phrynosoma orbiculare douglassii* (Bell).

Description.—General body form short and squat. Total length about 4¾ inches. Head about as broad as long. Ear small, naked or covered with scales. Spines on head very short. Spines on upper and lower lips small but prominent. Legs and tail short. Back, tail, and upper surfaces of legs with scattered, large, keeled, tubercular scales; between these, skin covered with smaller scales and granules. A series of spines along the sides of the body. Chest and belly and lower surfaces of hind legs and tail covered with small, smooth scales.

Colour of the back yellowish, brown, or grey with two or four rows of dark blotches. Each blotch with a light border along posterior edge. Under-parts white or pale yellow, sometimes with faint grey markings.

The Pygmy Horned toad is easily distinguished from all other reptiles by its flattened body and spiny appearance.

Distribution.—From British Columbia, through Washington, Oregon, and extreme northern California.

In British Columbia it has been found only in the southernmost part of the Okanagan valley at Osoyoos.

Habits and Habitat.—The only known specimens of Pygmy Horned toads from British Columbia are two taken at Osoyoos by the late C. DeB. Green. As a result of their rare occurrence nothing is known of their habits in this Province. In Washington, these lizards live on the open plains, usually among rocks and sand, where their protective colouring makes them almost invisible. Though ferocious in appearance they are perfectly harmless. When irritated, however, they may open the mouth, hiss audibly or inflate the body, but they make no attempt to bite. Horned toads are more useful than ornamental, as their food consists chiefly of insects. The young are born alive.

Although these reptiles usually live in very dry regions there is little doubt that the Osoyoos region, and perhaps also the Keremeos region, represents the extreme northern limit of the range of this interesting lizard, but since large areas of its natural habitat in these districts have been devoted to fruit-farming in recent years it is unlikely that the Pygmy Horned toad will ever be of common occurrence in this Province.

NORTHERN ALLIGATOR LIZARD. *Gerrhonotus cæruleus principis* (Baird and Girard).

Description.—General body form long and slender. Total length from 7 to 9 inches. Head pointed and flattened on top, length greater than the width. Eye large with round pupil and well-developed lid. Ear-opening distinct. Prominent skin fold on each side of body. Legs moderately slender and short, each with five digits ending in sharp claws. Tail when complete, long and slender, longer than body and head combined. Scales smooth; those on upper part of body and tail with a prominent keel.

Colour above olivaceous brown or grey with few or many small, irregular dark spots. Under-parts yellowish- or greenish-white. In juveniles, a broad brownish band covers the upper surface of head, body, and tail.

The Alligator lizard is not likely to be confused with any other reptile found in British Columbia. It can be distinguished from its nearest relative, the Western skink, by its larger size, dull coloured tail, and lack of stripes.

Distribution.—From British Columbia south through western Washington, Oregon, and northwestern California.

In British Columbia this lizard is widely distributed throughout the southern portion of the Province from the East Kootenay west to include Vancouver island, and north on the coast at least as far as Stuart island.

Habits and Habitat.—The Alligator lizard is found usually in colonies in dry rocky areas, such as bases of rock-slides near railway-cuts and on exposed bluffs, where it may be seen basking in the warm sunshine or scuttling through the dense ground-cover. It is extremely alert, darting for cover at the least sign of danger, and for this reason it is not easily caught.

This lizard has the ability of parting with its tail with ease, a feature which probably is of great value in saving its life, for while the pursuer stops to investigate the tail actively twitching on the ground the owner makes good his escape. The tail most often parts when it is grasped but it can also be shed voluntarily. The operation is bloodless since the wound is quickly sealed by a quick-forming scab. In due course a new tail grows from the old stump, but it never attains the length of the original tail and is usually of a darker colour.

The Alligator lizard's main food consists of insects and spiders, which it captures by sudden leaps and quick darts. The forked tongue is often extended, possibly as an organ of touch or smell, but does not aid in capturing and holding the prey as in the case of amphibians. The young, numbering three to seven, are born alive.

The Alligator lizard is of considerable economic interest, since it is the main host for the young stages of the Coast tick, *Ixodes californicus* Banks, found along the coast of British Columbia.

WESTERN SKINK. *Eumeces skiltonianus skiltonianus* (Baird and Girard).

Description.—General body form long and slender. Total length from 4 to 7 inches. Head rounded, longer than broad. Eye small with round pupil and well-developed lid. Ear-opening distinct. No skin fold on side of body. Legs slender and short; toes long, ending in claws. Tail long and slender, longer than body and head combined. Scales smooth and keel-less.

Colour above dark brown or dark olive. Two bluish-grey or pale brown stripes along each side, the upper stripe beginning behind the snout and extending on to the tail, the lower stripe beginning along the upper lip, passing through the ear-opening and the base of the hind leg to the tail. Legs olive, sometimes with dark brown markings. Tail of adults, slate grey; tail of young, cobalt blue.

Under-parts of body, legs, and tail yellowish-white, sometimes clouded with blue or slate on the belly and throat.

The Western skink can be distinguished from the Alligator lizard by the presence of the two pairs of stripes and the absence of the skin fold on the side of the body. Young individuals may be instantly recognized by the vivid blue colour of the tail.

Distribution.—From British Columbia south along the Pacific Coast through most of California; Lower California eastward through Nevada to Utah.

In British Columbia the Western skink appears to be confined to the south-central portion, particularly the southern Okanagan valley and Kootenay region around Nelson. It has been recorded from Vancouver island (*see* Boulenger, 1887; Ditmars, 1908; Van Denburgh, 1922), but according to present knowledge this seems to be incorrect.

Habits and Habitat.—This lizard is usually found in damp places, such as under decaying logs or behind loose bark of old stumps. It is sometimes rather slow in movement, when it may be easily caught with the hands, but in warm weather it is very quick and active. Its food consists mainly of insects and spiders.

When captured, adults, particularly males, may attempt to bite but they can do no harm. Like the Alligator lizard the skink can part with its tail by twisting the member off when it is grasped. The bright blue tail of juveniles may therefore have some survival value in holding attention while its owner escapes.

Eggs, three or four in number, are laid under some form of shelter and may be covered with a thin layer of earth. The shells are soft and flexible and blackish-brown in colour. The female remains in attendance coiled about the eggs until the young hatch.

KEY TO THE SNAKES OF BRITISH COLUMBIA.

1 (12) No "button" or rattle on end of tail
2 (3) Tail short and blunt, ending in one large conical plate
Pacific Rubber Snake (*Charina bottæ*).
3 (2) Tail long and slender
4 (5) Anal plate divided
Blue Racer (*Coluber constrictor mormon*).
5 (4) Anal plate single
6 (7) Series of dark brown blotches along back; no stripes
Gopher Snake (*Pituophis catenifer*).
7 (6) No such series of blotches; 3 longitudinal stripes
8 (9) General colour black, with or without red blotches on sides
Northwestern Garter Snake (*Thamnophis sirtalis*).
9 (8) General colour not black
10 (11) Head small, very little wider than neck; supralabials usually 7 and infralabials usually 9
Puget Garter Snake (*Thamnophis ordinoides ordinoides*).
11 (10) Head large, definitely wider than neck; supralabials usually 8 and infralabials usually 10
Wandering Garter Snake (*Thamnophis ordinoides vagrans*).
12 (1) Button or rattle on end of tail
Pacific Rattlesnake (*Crotalus viridis oreganus*).

PACIFIC RUBBER SNAKE. *Charina bottæ* (Blainville).
RUBBER BOA.

Description.—General body form short and stout. Total length 15 to 30 inches. Head rounded, blunt, and not distinct from neck. Eye small with vertical pupil. Ear absent. Plates of top of head large and irregular. A small spur in pit on each side of anus (more conspicuous in male than in female). Scales of body smooth and overlapping, arranged in from forty-one to ninety-nine longitudinal rows. Tail very short, nearly as blunt as head and ending in a large conical plate or scale.

Colour of the back and sides uniform greyish- or yellowish-brown. Under-surface light yellow, except the throat, which may be clouded with grey.

The Rubber snake can easily be identified by its short, stout form, uniform brown coloration, and sluggish movements.

Distribution.—From British Columbia south through Washington, Oregon, and California to the San Bernardino mountains and east to Montana, Wyoming, and Utah.

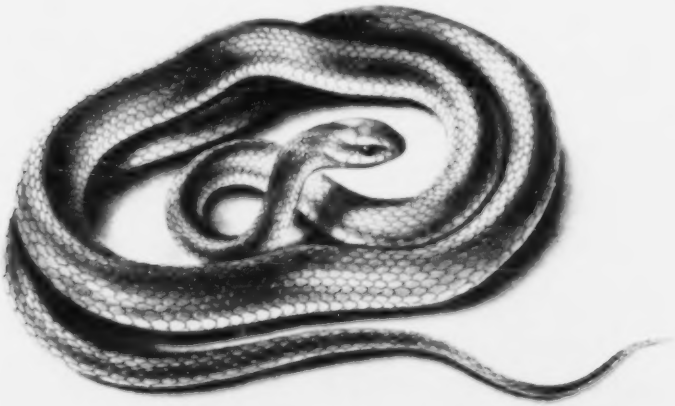
In British Columbia the Rubber boa is found at scattered points throughout the southern portion of the Province, east at least to Canal Flats and Radium Hot Springs, north at least to Rayleigh (10 miles north of Kamloops), and west at least to Hope and Harrison lake.

Habits and Habitat.—The Rubber boa apparently spends a great part of its existence below ground, burrowing in loose, moist soil or possibly living in burrows of mice, moles, and other subterranean animals. It is only occasionally seen in the open, sometimes sunning itself along roadsides. It is extremely sluggish and when picked up it makes no attempt to bite or escape, but twines itself around the hand or wrist, where it may remain for long periods. If alarmed it may roll itself into a ball with the head concealed and the tail raised up. In this position the tail can easily be mistaken for the head and for this reason it is sometimes called the Two-headed snake.

The food of the Rubber boa consists of mice (especially young, in the nest), small birds, or other small animals which it constricts in the same manner as the giant members of the family.

Nothing appears to be known of its breeding habits.

Besides its possible economic value as a destroyer of small rodents, this snake is interesting scientifically because it possesses spurs which represent rudimentary hind limbs.



WESTERN BLUE RACER. *Coluber constrictor mormon*
YELLOW-BELLIED RACER. (Baird and Girard).

Description.—General form long and slender. Total length up to 48 inches. Head distinct from the neck; large, long, with flattened top and rounded snout. Eye large and regular. Scales of body smooth, arranged in seventeen rows. Anal plate divided. Tail very long and whip-like.

Colour of back and sides of adults uniform greyish-green, olive, or yellowish-brown, changing to green or blue on the lower row of scales. Skin between the scales often black. Under-surface uniform yellow. In juveniles, a series of seventy to eighty-five "saddles" or partial cross-bands along the back.

The adult Blue racer can easily be recognized by its long whip-like form and greyish-green colour. Juveniles may be distinguished by the dorsal pattern of cross-bands which persists until the snake reaches a length of about 24 inches.

Distribution.—From British Columbia south through Washington, Oregon, and California, and east through Idaho, Nevada, and Utah to Montana.

In British Columbia the Blue racer is found in the interior Dry Belt, particularly in the Okanagan, Similkameen, and Fraser valleys, ranging east as far as Midway, west to Seton lake, and north at least to Kamloops.

Habits and Habitat.—The Blue racer, as its name implies, is an exceedingly swift snake, and one difficult to catch. It characteristically crawls with its head well off the ground and is a skilful climber, often running through the tops of bushes almost as quickly as if it were on the ground. It is often found in open fields, around orchards, or along the margins of ponds and rivers. The principal food items of the racer are probably insects, small rodents, birds' eggs, etc.

Little is known regarding the breeding habits of this snake. A female collected and sent to the Museum on July 2nd, 1941, by Mr. H. C. Dalziel, of Okanagan Landing, laid a batch of five eggs on July 18th. The eggs varied considerably in size, averaging about 1¾ inches long by ¾ inch wide and were enclosed in a parchment-like membrane of a dull white colour. They were destroyed by a fungus infection before hatching.

The Western Blue racer is a close relative of the Black snake of eastern North America and, like its cousin, is said to be the sworn enemy of the rattlesnake. However, there appears to be no truth in the statement that the racer hunts and kills rattlesnakes, although on occasion it may swallow snakes much smaller than itself.

When cornered it may turn and strike viciously. The bite can easily draw blood but, of course, is not poisonous.

GOPHER SNAKE. *Pituophis catenifer* (Blainville).
BULL SNAKE.

Description.—General form long but stout. Total length up to 6 feet. Head small, slightly larger than neck, flattened on top. Snout narrow and projecting beyond the lower jaw. Eye large with round pupil. Scales on back with keels, those on sides smooth. Scales usually in thirty-three or thirty-one rows. Anal plate single. Tail moderately long.

General colour of the back and sides pale yellow or greyish-yellow with dark brown keels to the scales. Along the back from the head to a point above the anus a series of forty-five to fifty-five dark brown blotches which are darkest toward the beginning and the end of the series. On the upper surface of the tail a series of twelve to sixteen dark brown cross-bars. Several series of smaller blotches or spots along the sides. A dark band on top of head in front of the eyes, a dark band from the eye to the angle of the jaw, and a dark

vertical spot below the eye. Under-surface yellow or yellowish-white with brown or black spots.

Two subspecies of this snake occur in British Columbia. The most common form is the Pacific Gopher snake, *Pituophis catenifer catenifer* (Blainville) which has fewer than 228 ventral plates; the less common Desert Gopher snake, *P. c. deserticola* Stejneger, has more than 228 ventral plates. In the latter subspecies the light scales of the interspaces between the spots on back and sides generally bear each a small central black spot, on at least the anterior part of the body, while such spots are generally lacking in the former.

Distribution.—From British Columbia south through western Washington and Oregon to California.

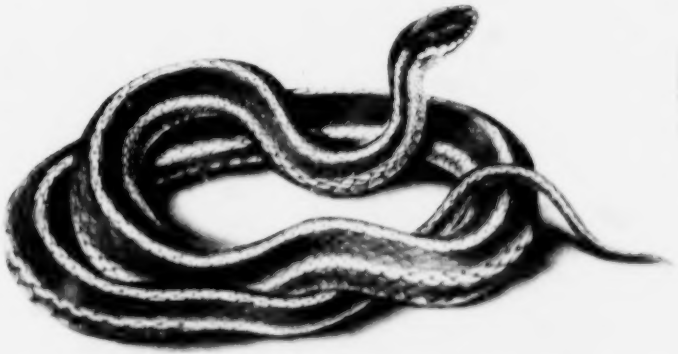
In British Columbia the Pacific Gopher snake is confined to the interior Dry Belt, north at least to Kamloops, east at least to Cascade, and west at least to Lillooet. It has been recorded from Sumas in the lower Fraser valley by Lord (1866: 307). The Desert Gopher snake is known from a single specimen taken at Osoyoos.

Habits and Habitat.—The Pacific Gopher snake is found along dry stream-beds in sage-brush country, in orchards, and along roadsides; in fact, wherever gophers and other small rodents are to be found. In addition to small mammals this snake also occasionally eats birds and birds' eggs, but its activities as an exterminator of mice and gophers probably far outweigh its minor depredations along this line. It appears to be diurnal in habit.

From observations on a captive specimen it has been learned that Gopher snakes probably lay their eggs in the summer months. The eggs, numbering nineteen in one case, are each covered in a parchment-like membrane which on hardening cements the eggs together in a cluster. The female lies coiled around the eggs and hisses fiercely when disturbed.

The Desert Gopher snake appears to be nocturnal in habit since individuals have often been observed in the evening or at night crossing roads. It is typically a desert snake and is more restricted in its habitat than its close relative the Pacific Gopher snake.

There is no evidence to support the apparently common belief that Bull snakes hunt and kill rattlesnakes nor is there any truth in the tale that these two species interbreed.



NORTHWESTERN GARTER SNAKE. *Thamnophis sirtalis* ssp.
STRIPED GARTER SNAKE.

Description.—General form long and rather slender. Total length up to 36 inches. Head flattened on top and with narrow, rounded snout. Eye large. One preocular. Usually seven supralabials and nine infralabials. Posterior chin-shields longer than anterior chin-shields. Ventrals 146 to 177. Caudals sixty-six to eighty-seven. Anal plate single. Tail moderately long and tapering.

Colour above dark brown or black, usually with three greenish-yellow, yellow, bluish, or greyish stripes running from the back of the head to the tip of the tail. Middle stripe includes middle row of scales and part of row on either side; lateral stripe often paler in colour, next to lowermost scale row on each side and part of row above it. Between middle and lateral stripes a series of red blotches produced by a red coloration of the skin between the scales. Red pattern usually lacking on Vancouver island specimens. Top of head usually uniform brown or black; upper lip light in colour. Under-parts whitish, greenish, or bluish-grey; chin and throat pale.

Three or more subspecies of this snake occur within the Province, differing mainly in colour pattern. On Vancouver island and the

lower mainland, *Thamnophis sirtalis pickeringii* (Baird and Girard) is found; in the Peace River district, east of the Rocky mountains, the race is *T. s. parietalis* (Say). Between these two areas—that is, over the greater part of the Province—occur snakes of the race *T. s. tetrataenia* (Cope). Possibly others will be described when further collecting and study is carried out.

Garter snakes with a single preocular plate and having a black ground colour with red blotches on the sides are almost certain to be of this species.

Distribution.—British Columbia south through Washington and Oregon, and east through Alberta, Manitoba, Minnesota, Missouri, Iowa, Utah, and Nevada.

In British Columbia the Striped Garter snake is found throughout the Province, at least as far north as the region about Hazelton and east to the Peace River district. It has thus the northernmost range of any of our reptiles.

Habits and Habitat.—This Garter snake is often found along the shores of lakes or streams or near the sea and does not hesitate to take to the water when disturbed. As a result of its aquatic habits it is sometimes called a "water snake."

Its food, which is obtained in or near water, consists largely of small fish, fish eggs, frogs, tadpoles, salamanders, insects, etc. On the sea coast it is sometimes seen catching small fish in tide pools.

The young are born alive in late summer, a single female producing twenty or more offspring at a birth.

PUGET GARTER SNAKE. *Thamnophis ordinoides ordinoides* (Baird and Girard).

Description.—General form long and slender. Total length up to 18 inches. Head flattened on top, very little wider than neck. Snout narrow and rounded. Eye small. One or two preoculars. Usually seven supralabials and eight or nine infralabials (sometimes one more or one less of either). Posterior chin-shields about equal to anterior chin-shields. Ventrals fewer than 155. Caudals fewer than eighty-five. Anal plate single. Tail moderately long and tapering.

Colour variable. Ground colour above, black, dark brown, reddish, bluish, or greenish, with usually a median stripe of yellow, brick red, or orange. Lateral stripes of greyish- or greenish-blue. Underparts greenish, bluish, or reddish-brown, often marked with bright red. Specimens all black in colour have been taken at Nanaimo (Hart, 1934) and Brentwood and a white one (albinistic) was found at North Vancouver (Cowan, M.S.).

Garter snakes having red coloration in the dorsal stripe or on the belly are likely to be of this species.

Distribution.—From British Columbia south along the coast through Washington, Oregon, and California.

In British Columbia the Puget Garter snake appears to be confined to the area west of the Coast mountains north as far as Bella Coola and including Vancouver island and certain islands in Georgia strait.

Habits and Habitat.—This snake is normally found in dense thickets, along roadsides, and the margins of fields. Wherever suitable habitat occurs it is likely to be the most abundant reptile present. Although it may be found near water it rarely swims, preferring to escape into the underbrush when disturbed.

The food of this snake consists largely of insects, slugs, earthworms, and other small organisms. Fitch (1940, p. 103) examined the stomach contents of forty-eight specimens and reported finding 63 per cent. slugs, 24 per cent. earthworms, and 12 per cent. salamanders.

Mating takes place soon after the snakes emerge from hibernation in March and April and the young are born alive, commencing about midsummer.

In general, Garter snakes of this species are quite inoffensive reptiles which never attempt to bite except under extreme circumstances. From the gardener's point of view they should be tolerated as they are of considerable importance as a pest destroyer, but if for other reasons their presence is objectionable the snakes may be discouraged by eliminating rock-piles and underbrush which usually afford them cover.

WANDERING GARTER SNAKE. *Thamnophis ordinoides vagrans* (Baird and Girard).

Description.—General form long and robust. Total length up to 40 inches. Head flattened on top and definitely wider than neck. Snout narrow and rounded. Eye moderate. Preocular usually single on the Coast, double east of the Coast range. Supralabials usually eight and infralabials usually ten, though one less may occur in either of these scale-rows. Posterior chin-shields longer than anterior chin-shields. Ventrals more than 147, usually more than 150. Caudals more than sixty-seven. Anal plate single. Tail moderately long and tapering.

Two types of coloration within the Province, each having a geographic association. East of the Coast range, ground colour brown with dorsal stripe of dull yellow and with less evident lateral stripes of the same colour on the second or third scale-row above the ventrals. Parallel rows of paired black or dark brown spots border on the dorsal stripe and encroach upon it. Alternating with these spots, another series of the same colour immediately above each lateral

stripe. Below each lateral stripe and alternating with the lateral spots (i.e., in line with the dorsal spots) a third series of smaller spots. Top of the head dull brown, faintly speckled with black; upper lips whitish. Under-parts uniform bluish-grey and slate; chin and throat whitish.

On the coast and on Vancouver island the ground colour is darker, frequently lead grey or almost black and the dorsal stripe is of a more brilliant yellow.

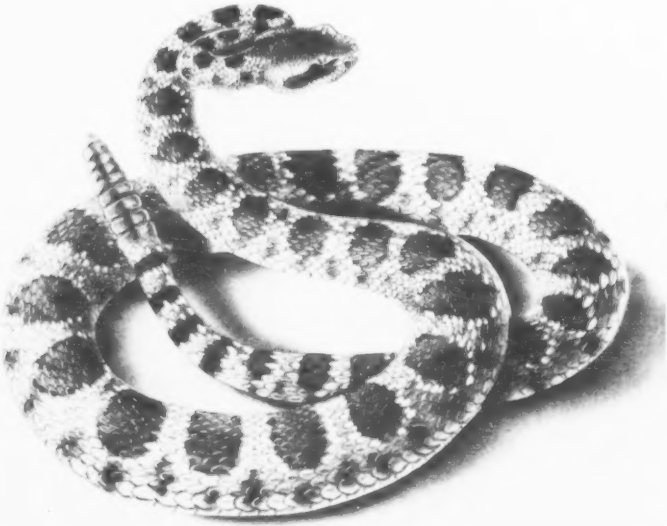
Distribution.—From British Columbia south through eastern Washington and Oregon, Idaho, to northern Arizona and eastern California.

In British Columbia it is found across the southern portion of the Province from the coast to the Rocky mountains, in the west as far north as the Chilcotin and to Stuie near Bella Coola, and in the east to the latitude of Banff.

Habits and Habitat.—The Wandering Garter snake is a beach-loving reptile seldom found far from water. Like the Striped Garter snake it is a good swimmer, taking to the water readily when alarmed. Of all garter snakes within the Province it is the most belligerent, striking fiercely and accurately when cornered and sometimes inflicting a painful wound with its sharp teeth.

The presence of many vertebrates in the food list of this snake indicates that it is an active and aggressive forager. An examination of sixty-nine snakes revealed the following food items: 33 slugs, 30 tadpoles, 23 leeches, 17 fish, 16 snails, 15 earthworms, 9 salamanders, 7 toads, 3 frogs, 2 tree-toads, 6 lizards, 4 birds, and 7 mice (Fitch, 1941). In this connection Dr. Cowan writes: "On Vancouver island beaches I have frequently watched this snake devouring large numbers of small fish left in pools by the receding tide." In the Cowichan valley the writer has often seen snakes of this species catching salmon and trout fry which have been trapped in backwaters during the dry season. Under such circumstances they may consume a large part of the fish population in small streams.

The breeding habits of this snake are much the same as those of the Puget Garter snake.



PACIFIC RATTLESNAKE. *Crotalus viridis oreganus* (Holbrook).

Description.—General form stout. Length up to 4 or more feet; average about 2½ feet. Head broad, flat-topped, much wider than neck. Eye moderate with vertical pupil. A deep pit between eye and snout (*see* Figure 4). Two (rarely one) preoculars. Supralabials twelve to seventeen. Infralabials fourteen to nineteen. Small scales on head. Scales in twenty-three to twenty-seven rows, keeled except in one or two rows on each side. Ventrals 158 to 189. Caudals fourteen to twenty-seven. Tail short, ending in horny rattle or button.

Ground colour brown, olive, or grey, with a series of large dark brown blotches along the back, becoming cross-bars toward the tail.

On each side and alternating with the dorsal blotches, a second series of smaller blotches. Some of the scales bordering the blotches of both series yellowish, light grey, or whitish in colour. Top of the head dark and a dark band from below the eye to the corner of the jaw. Under-parts yellowish-white, sometimes clouded with brown.

The Pacific rattlesnake is easily recognized by the presence of a button or rattle on the end of the tail and by the distinctive colour pattern of the back.

Distribution.— British Columbia south through Washington, Oregon, and southern California, and east through western Idaho, Nevada, mountains of central and southern Arizona, and north-western Lower California.

In British Columbia the Pacific rattlesnake is known to occur throughout the interior Dry Belt; east to the vicinity of Cascade, north to the Lac du Bois area (18 miles north-west of Kamloops), and west to Lytton. Individuals have also been reported to be present in the vicinity of Lillooet, on the west bank of the Fraser river, possibly having crossed the river by the bridge at that point.

Habits and Habitat.—The rattlesnake is perhaps the most interesting reptile to some persons because it is the only venomous species occurring within the Province. It is usually found in dry areas where there is some shelter from the sun, such as at the base of rock-slides, and in sage-brush country containing boulders and other places of retreat. According to local residents the snakes are not gregarious but spend the night individually under rocks or other shelter, moving out to the hunting-grounds each morning shortly after sun-up and returning each evening. At these times they are most often seen crossing roads or other open areas, but at other times are likely to be overlooked.

The food consists mainly of small mammals such as gophers, mice, and other rodents. Van Denburgh (1922) reports that Dr. J. Grinnell found chipmunks, gophers, meadow-mice, and lizards in California rattlesnakes. There seems to be little doubt that the Pacific rattlesnake is of considerable economic value in controlling the numbers of destructive rodents.

In British Columbia, rattlesnakes are said to congregate in "dens" part way up a bluff to spend the winter. Sometimes consid-

erable numbers of snakes are found in these hibernating places and while still sluggish they are easily killed.

In spite of its bad name and the undoubted poisonous qualities of its bite, the Pacific rattlesnake is a timid and non-aggressive reptile. Except when cornered, injured, or teased, this snake retreats to the nearest hiding-place whenever it is surprised in the open. However, when threatened or poked with a stick it gives a warning rattle and strikes quickly and often blindly. The greatest danger of being bitten probably occurs when the snake is stepped upon accidentally, because at this time the reptile is likely to strike at once without rattling.

In general it may be stated that the Pacific rattlesnake is not dangerous when left alone but, on the contrary, is of some considerable economic importance in exterminating harmful rodents. The writer risks censure in recommending that rattlesnakes should not be killed except around habitations or where there are children.

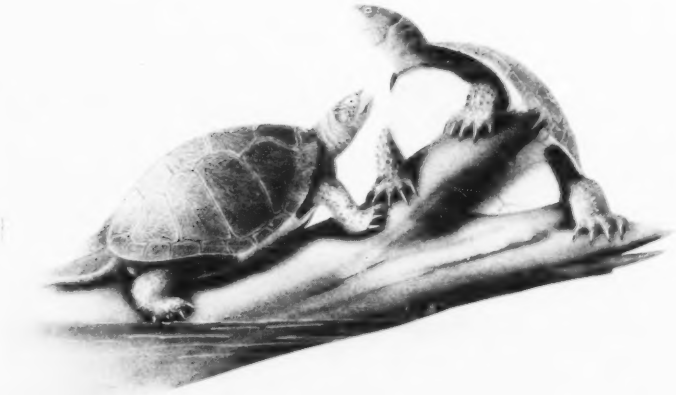
KEY TO THE TURTLES OF BRITISH COLUMBIA.

1 (4) Shell bony; size small; found in fresh water

2 (3) Colour pattern of under-parts yellow with brown blotches; no longitudinal stripes on head, neck, and limbs
Pacific Terrapin (*Clemmys marmorata*).

3 (2) Colour pattern of under-parts scarlet or yellow with black markings; longitudinal stripes on head, neck, and limbs
Western Painted Turtle (*Chrysemys bellii bellii*).

4 (1) Shell leathery; size large; found in salt water
Pacific Leather-back Turtle (*Dermochelys schlegelii*).



PACIFIC TERRAPIN. *Clemmys marmorata* (Baird and Girard).

Description.—General form of shell broad and low. Length of shell 5 to 6½ inches. Vertebral plates five, broader than long. Costals four. Nuchal very narrow. Marginals twelve on each side (*see* Figure 3). Plastron large, extending forward and backward almost as far as the carapace. Head large and somewhat flattened on top, covered above and on sides with smooth skin. Legs covered with scales. Front legs with five and hind legs with four digits, webbed to bases of long claws. Tail moderately long, covered with scales in irregular whorls.

Ground colour usually yellowish-olive with few or no markings. In some, a few broken and very irregular black lines may be present, frequently blending and crossing to form a fine network through which the original ground colour shows more or less indistinctly. Plastron yellow with irregular black or brown blotches. Head, legs, and tail yellowish marked with brown.

The Pacific terrapin is also known as the Pacific Pond turtle or Mud turtle. It can be distinguished from the only other native turtle, the Painted turtle, by the absence of red and green in the colour pattern.

Distribution.— Fresh waters of the Pacific slope from British Columbia to Lower California.

In British Columbia it is known only by two specimens, one collected near Burnaby lake, Vancouver, by Mr. Kenneth Racey in 1933 (Cowan, 1936) and one taken in a slough on the Jericho Golf Links in 1936, examined by the writer and identified by Mr. George P. Holland, of the Dominion Livestock Insect Laboratory, Kamloops.

Habits and Habitat.—Since this turtle has been taken only twice in British Columbia nothing is known of its habits in this Province. In other parts of its range the Pacific terrapin is found in ponds, small lakes, and occasionally in backwaters of rivers and streams. Along the coast it may be seen in brackish water or even at the edge of the sea. It is a shy species, fond of sunning itself over the water or at its edge where it can dive and swim to the bottom at the least disturbance. Being almost exclusively aquatic this turtle is found away from the water only at the egg-laying season, during June, July, and August.

The eggs are elliptical, with hard, white, limy shells, and measure about 1⅜ inches long. The nesting-site may be either in an open field or on a bare sandy bank, occasionally some distance from the water.

Pacific terrapins feed upon water-beetles and other aquatic insects. In captivity they eat earthworms, fish, and other meat. They hibernate in the bottom of the pond from about the end of September to March or April, depending upon the climate. In San Francisco during the period 1920 to 1930 this turtle was sold as food for $3 to $6 a dozen.

WESTERN PAINTED TURTLE. *Chrysemys bellii bellii*
BELL'S TURTLE. (Gray).

Description.—General form of shell comparatively narrow and low. Total length of shell up to 9½ inches. Scale arrangement variable. Vertebral plates usually five, usually longer than broad. Costals usually four. Nuchal very narrow. Marginals usually twelve on each side (*see* Figure 3). Plastron large, extending forward and backward nearly as far as the carapace. Head moderately large, covered above and on sides with smooth skin. Legs covered with scales. Front legs with five and hind legs with four digits, webbed to bases of long claws. Tail moderately long and with scales in regular series.

General colour olive green with yellow and red markings. Carapace dark olive, blotched irregularly with dark brown and bordered with a narrow band of yellow. Each marginal plate with a median yellow bar pointing inwards, joining other yellow markings on the other plates of the carapace. Plastron scarlet, reddish-yellow, or yellow with a large irregular dark blotch, or, in younger specimens, an intricate lyrate pattern. Lower surfaces of the marginals scarlet or reddish-yellow blotched with dark brown. Head and neck dark

green with yellow or greenish-yellow longitudinal stripes. A dark band horizontally through the eye. Legs and tail brownish-olive with greenish-yellow longitudinal stripes and spots.

The Western Painted turtle can be distinguished readily from the Pacific terrapin by the brilliant colour pattern on the under-parts and by the longitudinal stripes on head, neck, and limbs.

Distribution.—From British Columbia south through Washington and Oregon possibly to California, south-west into New Mexico and Texas, and east to western Illinois and southern Wisconsin.

In British Columbia the Painted turtle is found in certain districts of the southern portion of the Province—namely, in the Okanagan and Thompson valleys, from Osoyoos in the south to Genier lake, 40 miles north of Kamloops; in Shuswap lake; at Pender Harbour on the lower mainland; Texada island; and in Patterson lake, near Great Central lake on Vancouver island.

Habits and Habitat.—The Western Painted turtle is nearly always found in or near water. Its favourite habitat is a permanent pond or small lake, but occasionally it is also found along the margins of large lakes, such as Osoyoos lake and Okanagan lake in the interior of the Province. In these places turtles are commonly seen resting on floating logs or other objects near the water where they bask in the sun for many hours a day. Although they may not be disturbed by passing cars they slip into the water quickly when one approaches on foot and for this reason are difficult to catch.

The food of this turtle consists chiefly of animal material, but a certain amount of plant material is also taken. Mr. George P. Holland records the following items as being commonly eaten: Trout fry, tadpoles, fresh-water mussels, water-snails, aquatic insects, water-lilies, water-milfoil (*Myriophyllum*), Canada water-weed (*Elodea*), bulrush (*Scirpus*), and other water-plants. Captive specimens accept earthworms, chopped beef, lettuce, and cabbage.

From observations made in the field it is known that nest-building commences in the interior of the Province about the end of May while on the coast (Pender Harbour) it may be early in May. The site chosen for nest-construction is almost invariably situated on a southern slope exposed to the sun and comparatively close to the water. When a satisfactory site is found, a flask-shaped hole is dug by a scooping

action of each hind leg in turn, the soil being moistened by the turtle to prevent the sides from caving before the excavation is completed. The eggs, measuring about 1¼ inches in length, are white in colour and are covered with a parchment-like skin. From six to twenty, generally twelve or thirteen, eggs are dropped into the hole, after which the excavation is filled with soil and patted down with the plastron of the turtle (Holland, M.S.).

The period of incubation appears to be long. From available data it would seem that the young turtles hatch in the fall months but usually remain in the nest over the winter to emerge the following spring. At the time of emergence the shell of the young turtles measures almost exactly an inch and shows a pronounced dorsal fold or keel. Should a highway pass between the nesting-site and the water, numbers of turtles may be killed by traffic as they cross the road.

PACIFIC LEATHER-BACK TURTLE. *Dermochelys schlegelii* (Garman).

Description.—General form of shell narrow and low. Total length up to 9 feet. Carapace with seven and plastron with five longitudinal ridges. No horny plates. Head very large and not retractile. Limbs paddle-shaped, without claws; fore limbs very long. Head and limbs covered with leathery skin with no scales or plates.

Colour bluish-black, more or less spotted or marbled with white.

Since this is the only marine turtle likely to occur off the coast of British Columbia it can not be confused with any other species.

Distribution.—Tropical and subtropical waters of the Pacific and Indian oceans, wandering north along the west coast of North America at least to Nootka, B.C.

In British Columbia this turtle is known only from two specimens; one taken on August 16th, 1931 (No. 460 in the Provincial Museum), and the second captured two weeks later in the same locality, 8 miles south of Bajo reef, near Nootka sound, west coast of Vancouver island.

According to newspaper reports specimens were sighted by fishermen off the Pacific coast from California to Vancouver island during September, 1942.

Habits and Habitat.—This largest of living turtles is strictly marine, spending all its life at sea in deep water, the female coming ashore only to lay its eggs. From examination of stomach contents the food of this species appears to consist of jellyfish, crustaceans, and sea-weed; it possibly also feeds on fish. On the coasts of Ceylon, where the habits of this turtle have been studied, the egg-laying season extends throughout the year, reaching its height in May and June. The nests are dug at night on sandy beaches and from ninety to 150 eggs are laid in each nest. They require fifty-eight to sixty-five days to hatch.

In British Columbia this turtle is of such infrequent occurrence that it has no commercial value, but in other parts of the world where it is more numerous its flesh is used as food and its oil may be used in the manufacture of certain types of varnish. The species most commonly used as food, particularly in the form of soup, is the Green turtle (*Chelonia mydas* (Linn.)) of tropical and subtropical seas.

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GLOSSARY.

Anal plate.—The scale immediately in front of the anus in snakes and lizards.

Anterior.—Toward the head end.

Antivenin.—A substance produced in the blood to counteract the effect of snake venom.

Carapace.—The upper shell in turtles.

Caudals.—The series of single or double scales extending from the anus to the tail tip on the under-side of snakes and lizards; the two marginal scales of the carapace immediately above the tail in turtles (*see* Figure 3).

Chin-shields.—Elongated scales on the throat of snakes and lizards (*see* Figure 2).

Costals.—The series of scutes on the carapace of turtles between the marginals and the vertebrals (*see* Figure 3).

Dorsal.—Pertaining to or lying near the back.

Infralabials.—The series of scales bordering the lower jaw in snakes and lizards (*see* Figures 1 and 2).

Keeled scales.—Scales having a ridge or keel running lengthways.

Larva.—An immature stage of an animal which must undergo certain structural changes to become adult. Example: tadpole (larva) to frog (adult).

Lateral.—Pertaining to or situated at the side.

Lyrate.—Shaped like a lyre.

Marginals.—The row of scutes bordering the carapace in turtles.

Maxilla.—A tooth-bearing bone of the upper jaw.

Nuchal.—The marginal scute of the carapace immediately above the neck in turtles.

Palatines.—Bones forming the roof of the mouth.

Preoculars.—Scales immediately in front of the eyes.

Plastron.—The lower shell in turtles.

Posterior.—Toward the tail end.

Pterygoids.—In snakes, a tooth-bearing bone forming part of the upper jaw.

Scutes.—Large horny scales forming the outer covering in reptiles.

Supralabials.—The series of scales bordering the upper jaw in snakes and lizards (*see* Figures 1 and 2).

Tubercular.—Bearing tubercles, small wart-like protuberances.

Tympanum.—The drum of the ear.

Venomous.—Possessing poisonous qualities.

Ventrals.—The series of scales or scutes extending from the throat to the anus on the under-side of snakes and lizards.

Vertebral plates.—The central series of scutes in the carapace of turtles.

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APPENDIX.

THE TREATMENT OF RATTLESNAKE BITE.

Rattlesnake venom is a clear, thick fluid, yellowish in colour; when dried it forms a crystalline solid which retains its poisonous properties indefinitely. Its action when injected into the blood-stream is complex; it affects the nerves controlling the heart and diaphragm, it tends to break down the red-blood cells of the blood and causes swelling and discoloration of the parts near the bite. In small mammals such as mice, death usually occurs within a few seconds of being bitten; in larger animals the effects may last for several hours and in some cases results in death.

If gradually increasing doses of venom are injected into a large animal, such as a horse, it becomes immune to a dose of venom many times as great as would have killed it at first, due to the production of a substance in the blood-stream known as "antivenin" which counteracts the effects of the poison. If, now, a sample of blood is removed from the immunized animal the serum containing the antivenin may be separated and used as an antidote for snake bite in man and other animals by injecting it into the blood-stream of the victim.

The following notes and instructions pertaining to the treatment of rattlesnake bite have been taken from pages 41 to 43 of the "Field book of snakes of the United States and Canada," by Karl P. Schmidt and D. Dwight Davis, by kind permission of the authors.

> The treatment of snake bite has been cursed for ages by a host of popular remedies ranging from pure witchcraft to the serious attempt to neutralize the poison with burning gunpowder or some strong disinfecting agent such as permanganate of potash. It is somewhat horrifying to learn that the injection of permanganate solution in the vicinity of the bite, which was long recommended by the medical profession, is no more effective than the application of half of a freshly killed chicken, and is in fact more positively harmful. Modern experimentation has fortunately developed a first-aid procedure which is genuinely effective.
>
> The first aid now shown to be most effective consists simply in cutting open the spot bitten and the application of continued suction. Suction by mouth would be better than none; suction

by means of the small rubber bulb in suction kits available on the market for the purpose proves to be astonishingly effective.

The first-aid procedure now recommended results from experiments and experience in treatment of snake bite by Dr. Dudley Jackson, of the Robert B. Green Hospital, at San Antonio, Texas. Dr. H. K. Gloyd (1938) suggests the following:—

1. Do not run or do anything that will speed up circulation; do not use whisky or other forms of alcohol internally.
2. Apply a tourniquet between the bite and the heart. Do not tie it too tight. Soft rubber tubing, such as that furnished with the various snake-bite kits, makes the best tourniquet, but a shoe-string, handkerchief, or necktie will do.
3. Sterilize the skin over the area of the bite and with a sharp knife or razor blade, also sterilized, make cross cuts over each fang mark at least a quarter of an inch deep. Any standard antiseptic, such as iodine or mercurochrome, may be used for sterilization. If an antisepic is not available, use the flame of a match.
4. Apply suction to the incision. If the small rubber bulbs supplied with kits for this purpose are not available, the mouth may be used. There is no danger if there are no cuts or sores in the mouth or on the lips. The venom must get into the blood-stream to cause harm.
5. Continue the suction, loosening the tourniquet every ten minutes for a few seconds. As swelling progresses the tourniquet should be moved and kept just above it, and just tight enough to retard, but not obstruct, the flow of blood in the veins. Great harm may result if it is too tight. It should be loose enough to allow a finger to be slipped under it easily.
6. Get to a doctor or hospital as quickly as possible. Meanwhile continue suction.
7. If antivenin is available, after about an hour of suction, inject five ampouls (50 cc.) directly into the bite and the surrounding areas. An amount smaller than this, according to Dr. Jackson, is of no practical value.
8. If antivenin has been given as above, wait one hour before resuming suction; otherwise continue the active suction treatment.

   By this time you should have reached a physician. If not, continue suction for at least 15 hours.

It should be strongly emphasized that a snake-bitten person should be taken to a physician or hospital at once, if possible. Only a physician is qualified to meet emergencies that may arise during treatment.

CARE OF REPTILES IN CAPTIVITY.

Some of our native reptiles, particularly lizards and turtles, live well in captivity and make interesting pets. Much can be learned about their habits and characteristic adaptations by observing them at close quarters, which makes them useful for class-room demonstration.

As a cage a glass aquarium is most suitable, but since containers of this nature are not easily procured a satisfactory cage can be made by fastening together four rectangular sheets of window-glass by means of adhesive or cellulose tape applied to overlap the adjoining edges. A shallow baking-pan or cookie-sheet may be used for a base and a fifth piece of glass will act as a lid. If these materials are not available a wooden box fitted with a glass or wire front may serve the purpose.

Since reptiles are cold-blooded they are most active in warm weather. In captivity the container housing them should therefore be kept in a warm place, near a radiator or other source of heat. Lacking heat or in cold weather these animals become sluggish, remain almost motionless for long periods or enter into hibernation. Under these circumstances they may go without food for many months without harm. In the active condition they should be fed several times a week, except in the case of snakes, which fare best on not more than one feeding a week.

LIZARDS.—Lizards thrive best in a dry cage provided with a few stones, small rocks, or pieces of moss-covered bark under which they may hide. As food they will take living spiders, flies, grasshoppers, and other insects. Meal-worms (beetle larvæ found in stored cereals) are readily taken. These may sometimes be obtained from pet shops and may be bred for the purpose in bran held in an earthenware crock or metal container.

Although lizards go long periods without water a small dish of water should be provided so that they may take a drink when needed.

SNAKES.—In general the keeping of snakes in captivity in a class-room for any length of time is not recommended because of the difficulty in obtaining suitable food for them. Most snakes require living food in the form of small mammals, frogs, and various kinds of insects which are not always easy to provide. However, specimens of the

harmless snakes may be quite easily kept under observation for some weeks with only an occasional feeding or even with no food at all. Of these, Garter snakes are perhaps the most suitable since they are most easily obtained and since they will take a variety of foods, such as large earthworms, slugs, and insects. A dish of water should also be provided.

TURTLES.—The common Painted turtle of this Province makes an interesting pet that will soon learn to take food from the fingers. Turtles are best kept in a tank containing fresh water for them to swim and eat in and provided with a float or platform to rest on while out of the water. An aquarium may be made suitable for turtles by placing stones, clumps of moss, or small sods in one end to provide a bit of dry land. The container should be situated so that it receives a few hours' sunshine each day because these reptiles require sunlight to maintain health. As food they will take earthworms, insects, bits of chopped beef or fish, and occasionally a piece of lettuce or other greens. Fresh-water snails, a bit of bone-meal, or crushed fish-bone should be given them periodically to keep the bony parts of the shell in good condition.

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